WHAT IS CLAIMED IS:

1. A method for forming a dense Si-C-B-N composite, said method comprising:

(a) mechanically activating a powder mixture comprised of silicon nitride, silicon carbide, and boron nitride; and

(b) consolidating said powder mixture into a continuous mass by compressing said powder mixture in the presence of 0 to 1% by weight of metal oxide densification aids relative to said powder mixture, while passing an electric current through said powder mixture, to achieve a fused Si-C-B-N mass comprised of crystals less than 100 nanometers in diameter.

2. The method of claim 1 wherein said powder mixture is substantially amorphous.

3. The method of claim 1 wherein said crystals of said fused Si-C-B-N mass are less than 50 nm in diameter.

4. The method of claim 1 wherein any metal densification aid present in step (b) is from 0 to 0.5% by weight of said powder mixture.

5. The method of claim 1 wherein any metal densification aid present in step (b) is from 0 to 0.1% by weight of said powder mixture.

6. The method of claim 1 wherein step (b) is performed in the absence of metal oxide densification aids.

7. The method of claim 1 wherein said powder mixture consists essentially of from about 10 to about 60 parts by volume silicon, from about 10 to about 60 parts by volume carbon, from about 10 to about 60 parts by volume nitrogen, and from about 2 to about 30 parts by volume boron, based on a total of 100 parts by volume of said powder mixture.

8. The method of claim 1 further comprising forming said powder mixture by combining decaborane with a polyorganosilazane, followed by crosslinking and pyrolysis.

9. The method of claim **8** wherein said polyorganosilazane is a polyureasilazane.

10. The method of claim **1** wherein step (b) comprises compressing said powder mixture at a pressure of about 10 MPa to about 200 MPa and a temperature of about 900°C to about 3,000°C, and said electric current is a pulsed direct current of about 1,000 A/cm^2 to about 10,000 A/cm^2.

11. The method of claim **10** wherein said pressure is about 40 MPa to about 100 MPa.

12. The method of claim **10** wherein said temperature is about 1,000°C to about 2,000°C.

13. The method of claim **10** wherein said pulsed direct current is about 1,500 A/cm^2 to about 5,000 A/cm^2.

14. The method of claim **1** wherein step (b) is performed to achieve a fused mass with a density of at least 95% relative to a volume-averaged theoretical density.

15. The method of claim **1** wherein step (b) is performed to achieve a fused mass with a density of at least 98% relative to a volume-averaged theoretical density.

16. The method of claim **1** wherein step (b) is performed to achieve a fused mass with a density of at least 99% relative to a volume-averaged theoretical density.

17. The method of claim **1** wherein step (a) comprises milling said powder mixture by high-energy ball milling.

18. The method of claim **17** wherein said high-energy ball milling is performed with silicon nitride milling balls in an oscillating mill at about 6 or more impacts per second and a charge ratio of at least about 10:4.

19. A dense composite of silicon nitride, silicon carbide, and boron nitride, consisting essentially of crystals less than 100 nm in diameter and containing 0 to 1% by weight of metal oxide densification aids, produced by a process comprising:

(a) mechanically activating a powder mixture of silicon nitride, silicon carbide, and boron nitride; and

(b) consolidating said powder mixture into a continuous mass by compressing said powder mixture in the presence of 0 to 1% by weight of metal oxide densification aids while passing an electric current through said powder mixture, to achieve a fused Si-C-B-N mass comprised of crystals less than 100 nanometers in diameter.

20. The composite of claim **19** wherein said powder mixture of step (a) is substantially amorphous.

21. The composite of claim **19** wherein said fused mass consists of particles less than 50 nanometers in diameter.

22. The composite of claim **19** wherein step (b) is performed in the presence of 0 to 0.5% by weight of metal oxide densification aids.

23. The composite of claim **19** wherein step (b) is performed in the presence of 0 to 0.1% by weight of metal oxide densification aids.

24. The composite of claim **19** wherein step (b) is performed in the absence of metal oxide densification aids.

25. The composite of claim **19** wherein said powder mixture consists essentially of from about 10 to about 60 parts by volume silicon, from about 10 to about 60 parts by volume carbon, from about 10 to about 60 parts by volume nitrogen, and from about 2 to about 30 parts by volume boron, totaling 100 parts by volume of said powder mixture.

26. The composite of claim **19** wherein said powder mixture is formed by combining decaborane with a pyrolysis product of a polyorganosilazane in an inert atmosphere.

27. The composite of claim **26** wherein said polyorganosilazane is a polyureasilazane.

28. The composite of claim **19** wherein step (b) comprises compressing said powder mixture at a pressure of about 10 MPa to about 200 MPa and a temperature of

about 900°C to about 3,000°C, and said electric current is a pulsed direct current of about 1,000 A/cm^2 to about 10,000 A/cm^2.

29. The composite of claim **28** wherein said pressure is about 40 MPa to about 100 MPa.

30. The composite of claim **28** wherein said temperature is about 1,000°C to about 2,000°C.

31. The composite of claim **28** wherein said pulsed direct current is about 1,500 A/cm^2 to about 5,000 A/cm^2.

32. The composite of claim **19** wherein step (b) is performed to achieve a fused mass with a density of at least 95% relative to a volume-averaged theoretical density.

33. The composite of claim **19** wherein step (b) is performed to achieve a fused mass with a density of at least 98% relative to a volume-averaged theoretical density.

34. The composite of claim **19** wherein step (b) is performed to achieve a fused mass with a density of at least 99% relative to a volume-averaged theoretical density.

35. The composite of claim **19** wherein step (a) comprises milling said powder mixture by high-energy ball milling.

36. The composite of claim **19** wherein said high-energy ball milling is performed with silicon nitride milling balls in an oscillating mill at about 6 or more impacts per second and a charge ratio of at least about 10:4.